

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau

17 FEB 2005

(43) International Publication Date
1 April 2004 (01.04.2004)

PCT

(10) International Publication Number
WO 2004/027508 A1(51) International Patent Classification⁷: **G02F 1/31**(21) International Application Number:
PCT/JP2003/011609(22) International Filing Date:
11 September 2003 (11.09.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2002-275713 20 September 2002 (20.09.2002) JP(71) Applicants (*for all designated States except US*): NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY [JP/JP]; 3-1, Kasumigaseki 1-chome, Chiyoda-ku, Tokyo 100-8921 (JP). DAINICHISEIKA COLOR & CHEMICALS MFG. CO., LTD. [JP/JP]; 7-6, Nihonbashi Bakuro-cho 1-chome, Chuo-ku, Tokyo 103-8383 (JP).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): UENO, Ichiro

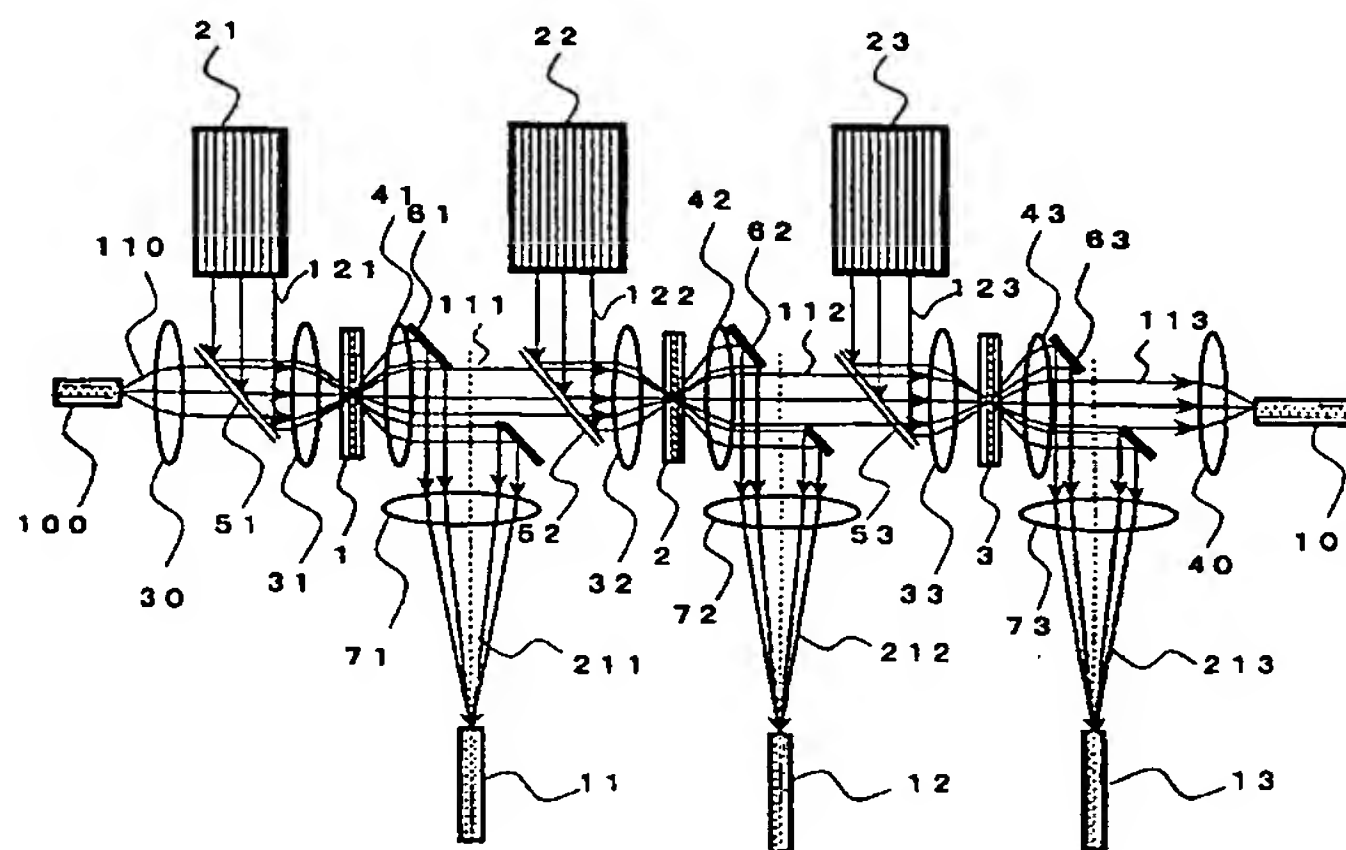
[JP/JP]; 5-5, Takamori 3-chome, Isehara-shi, Kanagawa 259-1114 (JP). HIRAGA, Takashi [JP/JP]; c/o NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY, Kansai, 8-31, Midorigaoka 1-chome, Ikeda-shi, Osaka 563-8577 (JP). MIZOKURO, Toshiko [JP/JP]; c/o NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY, Kansai, 8-31, Midorigaoka 1-chome, Ikeda-shi, Osaka 563-8577 (JP). YAMAMOTO, Noritaka [JP/JP]; c/o NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY, Kansai, 8-31, Midorigaoka 1-chome, Ikeda-shi, Osaka 563-8577 (JP). MOCHIZUKI, Hiroyuki [JP/JP]; c/o NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY, Kansai, 8-31, Midorigaoka 1-chome, Ikeda-shi, Osaka 563-8577 (JP). TANAKA, Norio [JP/JP]; c/o DAINICHISEIKA COLOR & CHEMICALS MFG. CO., LTD., 7-6, Nihonbashi Bakuro-cho 1-chome, Chuo-ku, Tokyo 103-8383 (JP).

(74) Agents: YOSHIDA, Kenji et al.; 34-12, Kichijoji-honcho 1-chome, Musashino-shi, Tokyo 180-0004 (JP).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE,

[Continued on next page]

(54) Title: OPTICAL PATH SWITCHING DEVICE AND METHOD



(57) Abstract: An optical path switching method according to the present invention comprises converging and irradiating, on a light absorption layer film provided in a thermal lens forming element (1, 2, 3) including at least the light absorption layer film, each of a control light (121, 122, 123) having a wavelength selected from a wavelength band which is absorbed by the light absorption layer film and a signal light (110, 111, 112) having a wavelength selected from a wavelength band which is not absorbed by the light absorption layer film. Arrangement of the light absorption layer film is adjusted such that at least the control light focuses within the light absorption layer film. A thermal lens is reversibly formed according to a distribution of refraction index created by a temperature increase generated in and around an area of the light absorption layer film in which the control light is absorbed, such that, according to whether or not the control light is irradiated, the converged signal light is output either as is in its converged form or after its spread angle is changed and a mirror (61, 62, 63) including a hole and reflecting means, the signal light output from the thermal lens forming element is either passed through the hole or reflected by the reflecting means to change the optical path.



GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(84) **Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP 03/11609

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G02F1/31

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

PAJ, WPI Data, EPO-Internal, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 011 007 A (MORIYA TETSUO ;HIRAGA TAKASHI (JP); AGENCY IND SCIENCE TECHN (JP);) 21 June 2000 (2000-06-21) the whole document	1-30
A	US 4 585 301 A (BIALKOWSKI STEPHEN E) 29 April 1986 (1986-04-29) the whole document	1-3, 16-18

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

25 February 2004

Date of mailing of the international search report

03/03/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Gill, R

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 03/11609

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1011007	A	21-06-2000	JP 11052435 A	26-02-1999
			JP 11119174 A	30-04-1999
			EP 1011007 A1	21-06-2000
			US 6452710 B1	17-09-2002
			WO 9908149 A1	18-02-1999
<hr/>				
US 4585301	A	29-04-1986	NONE	
<hr/>				